

# Next-Generation Ion Thruster Design Tool to Support Future Space Missions, Phase I

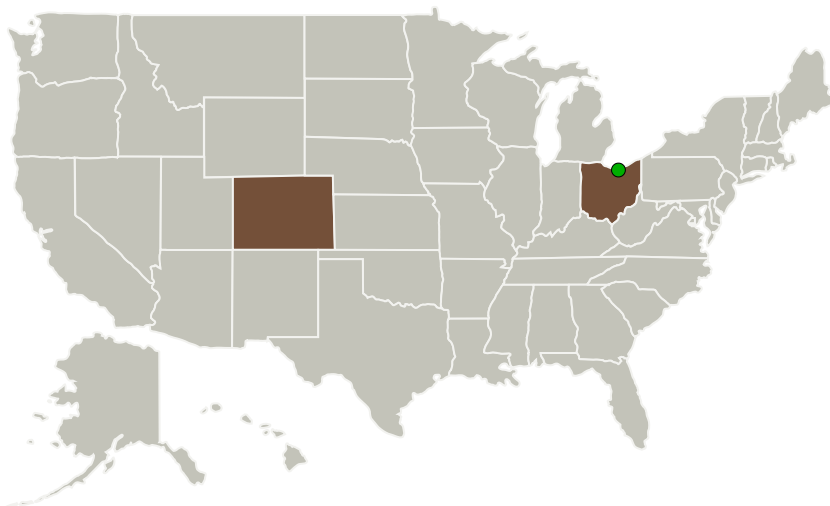
Completed Technology Project (2010 - 2011)



## Project Introduction

Computational tools that accurately predict the performance of electric propulsion devices are highly desirable by NASA and the broader electric propulsion community. Large investments in running the long duration test programs (> 20 kHrs) at NASA GRC can be reduced with computer models and allow more focus on exploring the NEXT ion thruster design for future space missions. The current state of electric propulsion modeling relies heavily on empirical data – frequently taken directly from the device of interest – and relies on numerous computational "knobs". A self-consistent particle model that minimizes the number of free parameters used in thruster modeling, and allows accurate electric thruster simulations is desired. We propose a kinetic model that simulates the dynamic electric fields inside the NEXT ion thruster discharge chamber plasma. This will be the first time that this has been done. In addition kinetic erosion models will be used for modeling the ionimpingement effects on thruster components. We envision one seamless model of the plasma from emission within the hollow cathode to ejection to outer space in the exhaust plume. This model will help NASA GRC to predict the lifetime operation of the high power ion propulsion options for earth-orbital applications.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Tech-X Corporation	Lead Organization	Industry	Boulder, Colorado
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
Wright State University-Main Campus	Supporting Organization	Academia	Dayton, Ohio

## Primary U.S. Work Locations

Colorado	Ohio
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## Project Transitions

▶ **January 2010:** Project Start

✓ **January 2011:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140137>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Tech-X Corporation

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

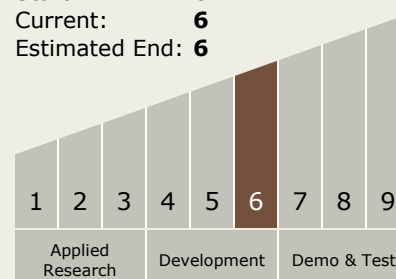
Carlos Torrez

### Principal Investigator:

Sudhakar Mahalingam

## Technology Maturity (TRL)

Start: 6  
Current: 6  
Estimated End: 6



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## Technology Areas

### Primary:

- TX01 Propulsion Systems
  - └ TX01.2 Electric Space Propulsion
    - └ TX01.2.3 Electromagnetic

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System